

## Message to Energy Managers

**Y**ou have to admit. One feature of your job is there's never a dull moment. New technologies, innovative practices and techniques, "exciting" products that slash energy or water consumption are continually entering the scene.

The focus of "energized" is to keep you informed of what other Energy Managers are doing in this ever-changing field. In this issue, we shift gears a little, however, and showcase what's on the horizon—what DON is researching and may soon be available to you in your battle against waste.

In addition we are including an insert this month describing this year's Energy Awareness Month activities and promotional pieces. Check out the website to order additional materials this year.

Next month we'll be back to the present, with energy-saving tips, guidelines on efficient procurement practices, and information on state-of-the-art products and projects.



William F. Tayler  
Manager Utilities/Energy

## MCB Hawaii Claims FEMP Award by Reclaiming Waste

**M**arine Corps Base Hawaii completed a \$3.5 million Hot Water Decentralization Project in FY01, earning its Energy Manager Bill Nutting a 2002 FEMP energy award.

Prior to project completion, the base operated five large steam boilers at two steam plants to provide steam to galley equipment in the Enlisted Dining Facility (EDF) and hot water to two BEQ complexes for domestic use. Four dedicated Boiler Operators fulfilled pressure vessel standards that require watchstanders 24 hours daily for the large steam boilers.

### Problems with the Old System

Marine Corps Base Hawaii at Kaneohe Bay had problems. The steam and hot water distribution systems were in poor condition, due for replacement shortly in order to bring the systems into full compliance. Environmental improvement projects totaling \$1.1 million were programmed for remedial improvements to make the steam plant fuel systems compliant.

After researching energy-efficient options, Bill Nutting, MCBH Energy Manager, determined that a Hot Water Decentralization project could meet customer needs while providing the savings needed to fund the project under an Army Engineering and Support Center ESPC.



*Chilled water plant with retrofitted water-source heat pump, gas boiler back-up, hot water storage tank, and new cooling tower at MCB Hawaii.*

### New System Offers Savings and More

With the project now complete, waste heat reclaimed from air conditioning chillers provides the domestic hot water to the BEQs. Two newly installed small modular boilers furnish steam to the Enlisted Dining Facility. The new system is generating an annual savings of 24,500 MBtu and nearly \$600,000. This includes an annual \$66,000 in energy cost savings and more than \$523,000 in ancillary cost savings. Most of the ancillary cost savings results from the deactivation of the

*continued on page 3*

DON Energy Awareness Website: Access the tools on the Navy Energy website for ideas, planning tips, and tools. Set your browser to <<http://energy.navy.mil>> and scroll down the left-hand column to the Awareness pick.

## Chilling With Sound

Have a hankering to chill your Cherry Garcia™ and to listen to Jerry Garcia using the same system? The concept may not be too far off. The Office of Naval Research has long funded researchers at Penn State who now have proved they can build a compact freezer case substituting sound waves for chemical refrigerants.

"The Navy has been looking for years for alternatives to freon-based cooling systems aboard Navy ships to save energy as well as the environment," says ONR's Steve McElvany, science manager for Navy's TRITON (for 3-ton chillers) program. "The Navy would like to find an ecologically friendly way for distributed cooling aboard our carriers. The early research we funded in this area has led to Garrett's freezer concept."

Although freon-based refrigerants were banned in 1996 over concerns about the hole in the ozone layer, the use of other chemicals still add to greenhouse gasses. The thermo-acoustic freezer case envisioned by Dr. Steven Garrett and Matt Poese at Penn State—partially funded by Ben & Jerry's as well as the Office of Naval Research—would use high amplitude sound energy to cool itself.

In tests, Garrett's team used a "souped-up" loudspeaker to generate high-amplitude sound energy in inert pressurized gasses. While you might not be able to safely listen to Jerry Garcia at decibels higher than 120 (about the loudest racket one could tolerate at a rock concert), Garrett's team reached sound levels hundreds of thousands of times higher (173dB), and reached a temperature differential of -8 degrees below zero—cool enough for that tub of ice cream. And quite enough, too, to take care of distributed cooling systems in the U.S. Navy fleet.



## Outwitting Barnacles to Save Fuel

"Billions of them glue themselves to ship hulls and cost the U.S. Navy over \$50 million a year in fuel costs alone due to friction and drag," says ONR's Paul Armistead. What's worse is that each of the Navy's ships is obliged to be cleaned in port yearly—sometimes even more frequently.

We're talking the humble barnacle. Historically, everything from pitch to pesticides has been used to try to deter it, but nothing seems to repel completely this determined crusty fouler.

Now consider the sleek, smooth dolphin, which can spend its entire life in the water and never host a single barnacle, while a ship—also designed with a smooth, sleek hull—can develop a bad case of them in less than a month.

"Much can be gained by studying and mimicking biological solutions that have evolved over eons," said Armistead. As manager of ONR's Polymer Chemistry program, Armistead supports Karen Wooley, a polymer chemist and professor at Washington University in St. Louis who researches interactions between biological systems and synthetic materials.

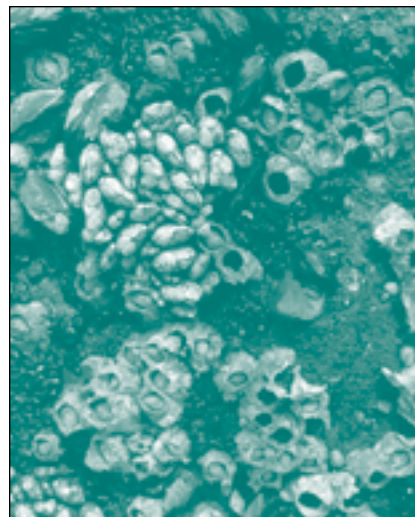
"Over the years, Navy research into antifouling hull coatings has increasingly focused on non-toxic approaches\*. An obvious first choice is Teflon-like coatings, but barnacles are able to get a good grip on these fluoropolymers," says Armistead. For ONR, Wooley decided that rather than look at smooth surfaces, she would create surfaces that were a complex and rough pattern. She based this upon the hypothesis that interrupting the attachment of adhesin proteins—secreted by many organisms to serve as glues—would result in fewer organisms settling on these surfaces in the first place, and would prevent them from staying attached long if they did get a foothold.

Meanwhile, Wooley noted—as others had—that at the nanometer level the sleek dolphin's skin was not smooth at all, but rippled. This might be why nothing could adhere to it—it was too rough at this size for a sticky critter to gain even a tiny foothold.

Wooley mixed two contrary polymer types, one smooth, linear, and water-loving (polyethylene glycol—the substance found in hand lotions and shampoos), and one hyperbranched, water-avoiding, and highly fluorinated (like Teflon), so she could allow them to phase-separate into separate domains, but intersperse into the other. When the mixture solidified, the heterogeneous coating created was a nano-scale terrain of mountains and valleys—similar to dolphins skin.

"Karen's approach is really quite novel in that it combines surface physical textures and chemical heterogeneity both on the size scale of a barnacle's secreted glue—a coiled protein chain," says Armistead. "Variations of her coatings are being evaluated in the labs of Navy investigators. Early experiments show an exceptionally low settlement rate for some critters."

"Different formulas give us different compound surface properties, so if we tweak the size of the surface features to what's needed, perhaps we'll finally have outwitted the barnacle," says Wooley.



*\*The world-wide use of tin based paints—used now to combat the problem but highly toxic to the environment—has been banned by the UN's International Maritime Organization. The U.S. Navy evaluated tin-based paints in the 1980's but never adopted them because of early environmental concerns. In 2008, any ship not complying with the UN ban will be denied access to main port states.*

# The Shadow Knows... How to Save Fuel

*Hybrid vehicle successfully demonstrated for Marine Corps*

**M**arine recon may soon get some new wheels: a vehicle with a hybrid electric and diesel drive. Fast, quiet, and with excellent off-road performance, the Reconnaissance, Surveillance, and Targeting Vehicle (RST-V)—informally called the Shadow—successfully completed a 1000-mile performance and reliability test in December 2002. It successfully sustained highway speeds over its extended drive through mountain passes, rain, snow, and rough construction zones.

The Office of Naval Research (ONR) in partnership with the Defense Advanced Research Projects Agency (DARPA) sponsored development of the Shadow by General Dynamics Land Systems. In a three-day test, the Shadow drove from Fort Benning, Georgia to General Dynamics' test facility in Muskegon, Michigan.

The Reconnaissance, Surveillance and Targeting Vehicle program is designing, developing, testing and demonstrating four advanced hybrid electric drive vehicles. They feature an in-hub hybrid-electric drive that lets them run for twice the range or length of time as other current systems. This in-hub drive uses powerful, affordable permanent magnets developed over the last 20 years by Naval materials scientists.

The Shadow has demonstrated maximum road speeds of 70 miles per

hour; it's also a 4x4 capable of significant cross-country speed. Its hybrid drive lets the Shadow run silently—on batteries alone—for 20 miles. The vehicle can generate up to 60 kilowatts of auxiliary electric power on its own, reducing the need for Marines to tow bulky, noisy generators.

Readily deployable because it can roll on and roll off standard helicopters like the CH-53 and CH-47, and standard cargo aircraft like the C-130, the Shadow is designed to be easily carried inside the Marines' new V-22 Osprey tilt-rotor aircraft. Its integrated survivability technologies and advanced suspension give the Shadow considerable battlefield capability. Recon units will use its integrated precision geo-location, communication, and sensor subsystems to give commanders tactical ground truth on the battlefield.

The Marines can use it for fire support coordination, forward air control, reconnaissance, light strike, anti-armor, or air defense. It can also serve as a battlefield ambulance, cargo or personnel carrier, mortar carrier, command post carrier, and even a mobile 60 kW generator.

For more information, contact: Jeff Bradel, Program Officer, Office of Naval Research, at [bradelj@onr.navy.mil](mailto:bradelj@onr.navy.mil); Phone: 703-588-2552.

*Adapted from an article by John F. Petrik.*



## Navy Orders Superconductor Propulsion Motor

**T**he U.S. Navy's Office of Naval Research awarded American Superconductor Corporation (AMSC) a contract in March 2003 to design and build a prototype 36.5-megawatt propulsion motor using high-temperature superconductors (HTS). The Navy's HTS motor will produce nearly 50,000 horsepower while measuring less than half the size and roughly one-third the weight of a standard motor with copper conductors. ONR specified in the contract that the motor be delivered to the Navy in 37 months.

"The U.S. Navy is going electric," says Rear Admiral Jay M. Cohen, Chief of Naval Research. "Superconductor technology will help reduce the size and weight of motors, generators, power transmission and supporting electrical components to help speed the transition to electric this decade."

According to an AMSC press release, another contract from the ONR to build and demonstrate a 5MW/230rpm HTS propulsion motor is on budget and on schedule. The final assembly of the motor has been completed at Alstom Power Conversion and factory testing has been initiated. The motor with its power electronic drive is expected to be delivered to the Navy on schedule in July 2003 for further testing.

### Attention DON Registrants Attending Energy 2003 in Orlando

*You are invited to the following meetings:*

**DOD Open Forum:**  
Wednesday, 20 Aug.: 2 p.m. – 5 p.m.

**DON Energy Meeting:**  
Thursday, 21 Aug.: 8 a.m. - 12 p.m.

**Marine Corps Energy Meeting:**  
Thursday, 21 Aug.: 1 p.m. – 4 p.m.

### MCB Hawaii, continued from page 1

two steam plants, all steam distribution piping, and most of the hot water distribution piping, and elimination of four Boiler Operator/watchstander positions. The one-time cost avoidance of more than \$1.1 million in environmental work that would have been required on the old steam plant fuel

systems helped to shorten the payback and financing period. Financing is limited to eight years, when the last of the old BEQ buildings will be demolished and replaced under the MCB Hawaii BEQ Replacement Construction Program.



## Check It Out



### Important News on DUERS WebSite!

New Defense Utility Energy Reporting System (DUERS) is up and training is available through October 2003. The address is: <http://energy.navy.mil>; select "Progress / Data / Reports," then select "DUERS".

The user-friendly DUERS website, operational since 2002 October, replaced the old bulletin board system which was anything but user-friendly. So far the new system has received extremely positive feedback. Advantages of the DUERS website include: easier access— via web interface as opposed to dial-up modem; real time reporting; full access to your data and corrections; and real time data tolerance checking.

If you are a DUERS reporter, don't miss the upcoming, essential training. This free, one-day course covers all aspects of DUERS reporting. It provides not only guidance for reporting but also an opportunity to network with the other DUERS reporters in your area. It covers data collection, conversions, KSF, the new web reporting system and other DUERS topics. The afternoon will focus on addressing your individual concerns and for you to provide your feedback on the new system.

For more information on the DUERS training, contact Kerrie Trotter at 805-982-3581 or via e-mail at [trotterkl@nfesc.navy.mil](mailto:trotterkl@nfesc.navy.mil)

*energized*

## Watts News?

**We want to hear from you.**

*Tell us about the energy initiatives you're working on, the problems you encounter, and the solutions you discover.*

Submit article ideas, comments, or questions to:

Dean Ryan Consultants & Designers, Inc.  
1733 King Street, Third Floor  
Alexandria, VA 22314  
Phone: (703)548-8115  
Fax: 703.548-6855  
e-mail: [sarahb@deanryan.com](mailto:sarahb@deanryan.com)

*Be sure to include your name and commercial phone number.*

*energized* is a publication sponsored by the Energy and Utilities Management Division, Naval Facilities Engineering Command. The views and opinions expressed in this publication are not necessarily those of the Department of the Navy.

*Printed by the Naval Facilities Engineering Service Center*



Department of the Navy  
Commanding Officer  
NFESC  
Code: ESC 22  
1100 23rd Avenue  
Port Hueneme, CA 93043-4370